Exploring affective perception and social action

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Summary

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From a traditional psychological point of view cognitive processes like memory, decision making and problem-solving body and brain are not essential for the understanding of cognitive processes, but could be implemented in any kind of 'hardware', like an abstract code that can run on any kind of computer. However, the natural, seemingly effortless way in which people interact with each other and execute complex actions that are perfectly tuned to the environment, seems to call for another perspective, one that emphasizes the specific role of the (interactions between) brain, body, and environment in cognitive processing. This perspective is currently taking shape in the embodied cognition approach, which states that cognition is grounded in our brain and body, which, in turn, implies that cognition is situated because the body cannot be detached from the environment.

The present theses comprises two research lines that are inspired by this overarching perspective, namely (1) the influence of affect on visual perception, and (2) the interpersonal coordination of movement. To get an idea of the kind of research associated with the embodied cognition approach, *Chapter 1* starts with a brief characterization of three pertinent strands of research. From this sketch a picture emerges in which bodily and environmental cues can substantially facilitate cognitive processing, in which motor control forms an integrated part of cognition, and in which (complex) patterns of brain and behavior can emerge in a spontaneous, self-organizing manner. Next, the thesis' lines of research are outlined by introducing the specific research area and experimental paradigm pertaining to each research line.

The first research line, described in *Chapter 2* and *3*, deals with the question whether and how affective information influences visual perception, or more specifically, visual size perception. *Chapter 2* presents a study in which two experiments were conducted, one addressing this question in a plain, straightforward manner, and another in which the stimuli were embedded in the Ebbinghaus illusion to examine whether affective and contextual properties interact with size judgments. The first experiment investigated the influence of affective content on size perception by examining judgments of the size of target circles with and without affective (i.e., positive, neutral and negative) pictures. The results indicated that circles with a picture are estimated to be smaller than circles

without a picture. Furthermore, circles with a negative picture were estimated to be larger than circles with a positive or a neutral picture, thus confirming that size perception is influenced by affective content, at least in the context of negative stimuli only. In a second experiment, we examined whether affective content influences the Ebbinghaus illusion. Participants judged the size of a target circle whereby target and flanker circles differed in affective content. The results replicated those of the first experiment; in addition, it was found that the Ebbinghaus illusion was weakest for a negative target with positive and blank flankers. A plausible explanation for these findings is that unpleasant stimuli capture and demand more attention than neutral or positive stimuli and are therefore underestimated less.

Chapter 3 reports a study that further explored the issues raised in the previous chapter by disentangling the effect of affective and physical stimulus features (such as brightness, contrast, shapes, areas) on visual size estimation. One group of participants estimated the size of circles with positive, neutral and negative pictures, whereas another group estimated the size of circles with blurred counterparts of these pictures. In both groups response times were measured to examine whether affective and physical stimulus properties were processed differently. Size estimations of circles containing affective pictures took longer and were less accurate than size estimations of circles containing blurred pictures. For affective stimuli, circles with negative pictures were estimated more accurately and evaluated more elaborately than circles with positive pictures. Apparently, affective stimulus properties influence size estimation above and beyond physical stimulus properties due to different processing forms; among the affective stimuli negative stimuli are underestimated less than positive stimuli due to increased attentional demands.

The second line of research investigates whether spontaneous pattern formation processes are operative when two people are walking side-by-side and whether this phenomenon abides by a similar dynamical model as other forms of intra- and interpersonal coordination, that is, the HKB-model (Haken, Kelso, & Bunz, 1985). *Chapter 4* examines whether and how people synchronize their leg movements while walking side-by-side on a treadmill. Walker pairs were either instructed to synchronize their steps in phase or in antiphase or received no coordination instructions. Frequency and phase analysis revealed that hallmarks of

the HKB-model – differential stability of in- and antiphase, systematic effects of walking speed and difference in individually preferred stride frequencies – were absent during instructed in-phase and antiphase coordination. Without instruction clear evidence was found for spontaneous coordination, that is, episodes of frequency- and phase-locking, albeit not always at (or near) 0 or 180 degrees. These results suggest that the HKB-model does not apply to interpersonal coordination during walking side-by-side in a straightforward manner. When the typically involved parameter constraints are relaxed, however, this model may largely account for the observed dynamical characteristics.

In *Chapter 5* the applicability of the HKB-model to interpersonal coordination during walking side-by-side is further examined by using a principally different approach as the one used in *Chapter 4*. Six pairs of participants were invited to coordinate their stepping movements at seven prescribed relative phases (between 0° and 180°) to scan the attractor-layout governing their coordination. For each relative phase participants were instructed to step in time with metronome beeps supplied individually through earphones and to continue walking after the metronome stopped. Three predictions of the HKB-model were tested. First, variability of in- and antiphase should be lowest, for which we found no support. Second, intermediate relative phases should be attracted to in- and antiphase, which was partially supported. In case of metronome-paced walking in-phase but not antiphase coordination acted as an attractor for nearby relative phases, whereas during unpaced continuation both coordination patterns seemed to act as an attractor. Finally, the absolute shift away from the required relative phase should be highest for a required relative phase of 90°, which was found to be the case. These findings extend and strengthen the conclusion of Chapter 4 that interpersonal coordination during walking side-by-side on a treadmill appears to go beyond the HKB-model.

In *Chapter 6*, the Epilogue, the findings from both lines of research are recapitulated and discussed in light of the general framework presented in *Chapter 1*, the embodied cognition approach. For the first line of research it is concluded that, in general, the studies reported in *Chapter 2* and *3* point in the direction of an affective influence on size judgments via an attentional mechanism. These studies further demonstrate that it is important to consider affective processes ‘in the head’ in conjunction with physical aspects of objects. However, in order to better

understand the influence of affect on perceptual and motor tasks, more strictly controlled psychophysical research is required aimed at elucidating the underlying mechanisms. With regard to the second line of research it is concluded that HKB-like dynamical principles of self-organization may manifest themselves to a greater or lesser degree in constraining interpersonal behavior depending on the prevailing physical, cognitive and social-affective context. It is discussed how this kind of synchronization may both enable and constrain (fluent) joint action.